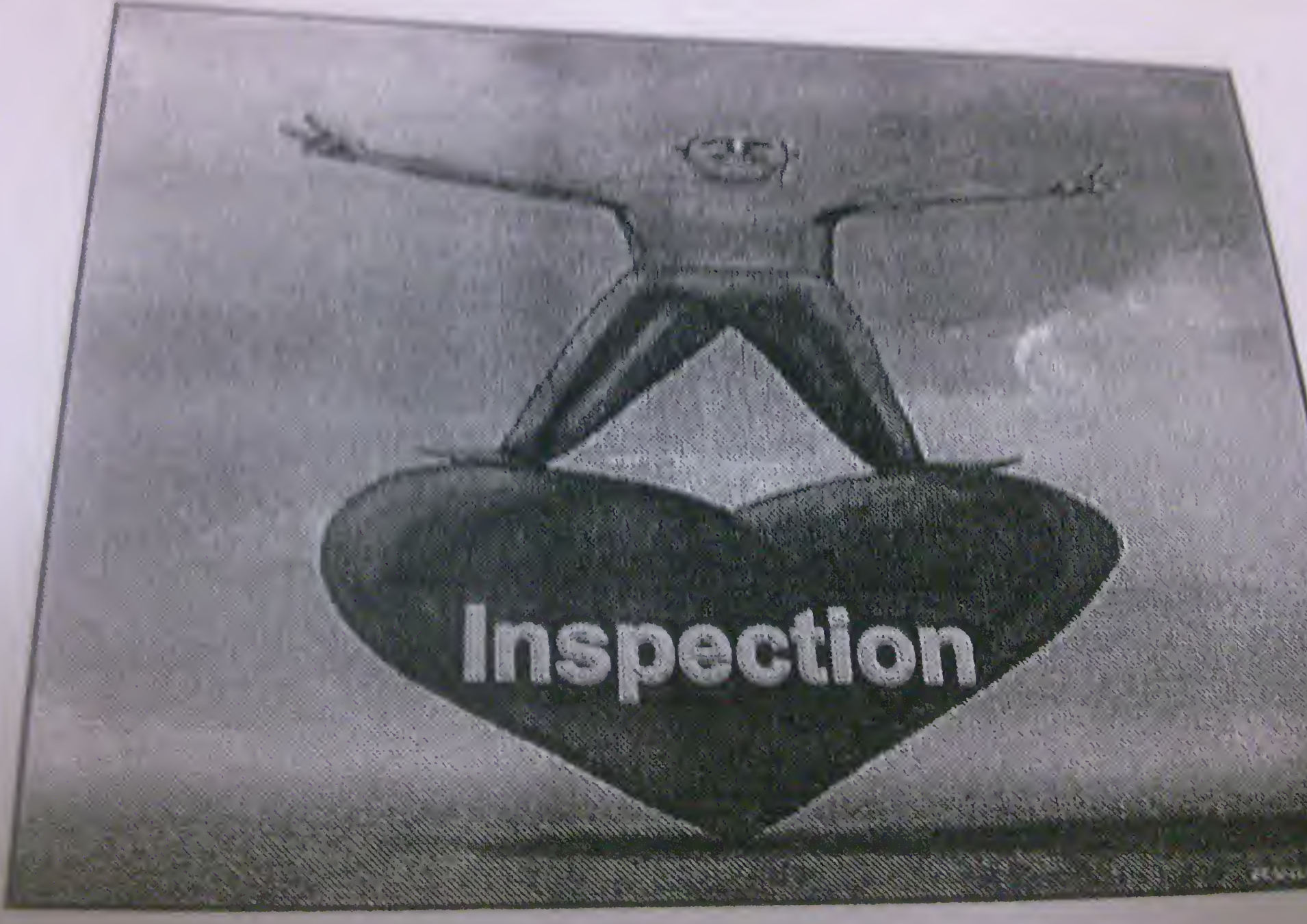


Pediatric Cardiac Examination

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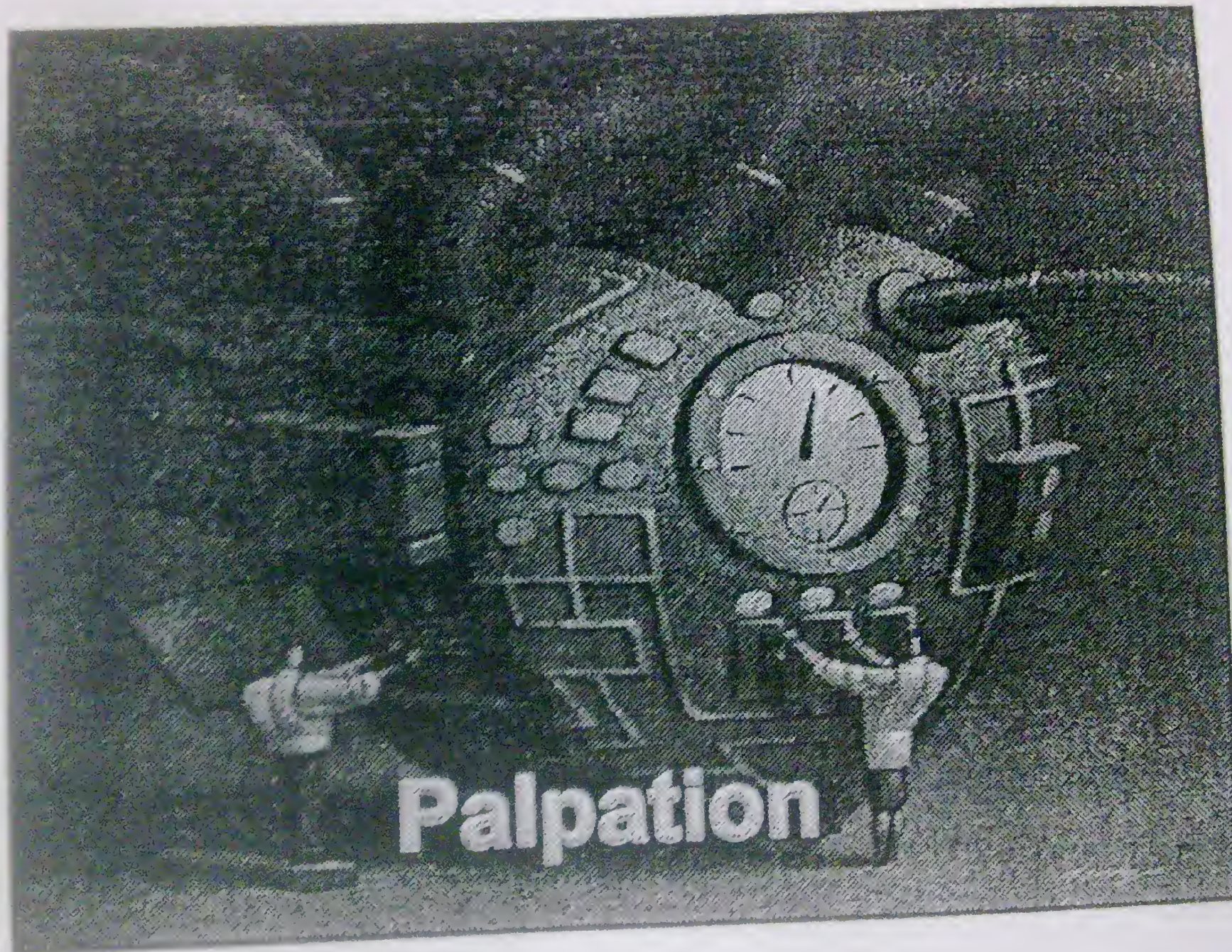
Inspection

Inspection

- Make the child lay supine , bare from the umbilicus up wards.
- Inspect the heart while you are looking up from the child's feet for:

Inspection

1. Precordial bulge indicates long standing cardiomegaly. As in longstanding congenital heart disease and chronic rheumatic heart disease.
2. Apical pulsation.(the outermost lower most visible pulsation
3. Epigastric, pulsation
4. Parasternal pulsations
5. Suprasternal pulsation
6. Inspection for scars which may denote pervious cardiac surgery.



Palpation

- Stay to the right side of the patient.
- With the fingers tips of your right hand do the following:

Palpation

1. Palpation of the apex. R+
2. palpation of the left lower parasternal area
(Tricuspid area) ?
3. Palpation of the 2nd right (pulmonary area) and 2nd left (aortic area) intercostal spaces.
4. Palpation of the 3rd left (2nd aortic area).
5. Palpation of epigastric area.
6. Palpation of suprasternal area.
7. Palpation for any thrill. Palpation is best done by the tips of the fingers and the medial aspect of the palm

Palpation

Apex

- It is the lowermost outermost definite palpable point of cardiac impulse.
- It is usually located in the 4th left intercostals space just lateral to the midclavicular line in the first 2 years of life, and in the 5th left intercostals space inside or just medial to the midclavicular line after that.
- Apex can be displaced from its usual site by some conditions as cardiomegaly, chest disease or skeletal diseases.

Palpation

Apex

Cardiac causes of apex displacement includes:

- a) Right ventricle (RV) enlargement displaces the apex outwards
- b) Left ventricle (LV) enlargement displaces the apex outwards and downwards.

Palpation

Apex

- Apex can be not palpable in cases of obesity, pericardial effusion or emphysema
- The characters of the apex may be changed by cardiac conditions.
- It may be (diffuse or localized), (strong or weak) and (sustained or ill-sustained).
 - Left ventricular hypertrophy usually results in strong, sustained localized apex.
 - Left ventricular dilatation results in ill-sustained apex.
 - Right ventricular hypertrophy results in lift of left lower sternal border

Palpation

Other pulsations

- Palpable 2nd heart sound (diastolic shock): it is palpated in the 2nd left intercostals space in cases of pulmonary hypertension.
- Epigastric pulsation: it is palpated to originate from above in cases of RV hypertrophy.
- Suprasternal pulsations: it is palpated in cases of aortic stenosis ,coarctation of aorta and patent ductus arteriosus.it may normally palpated in thin female or high arched aorta.

Palpation

Thrills

- Thrill is a palpable murmur.
- It is palpated where the murmur is forth degree.
- It may be systolic or diastolic according to the type of murmurs.
- Its site differ according to cardiac lesion.



Kh. Harbi

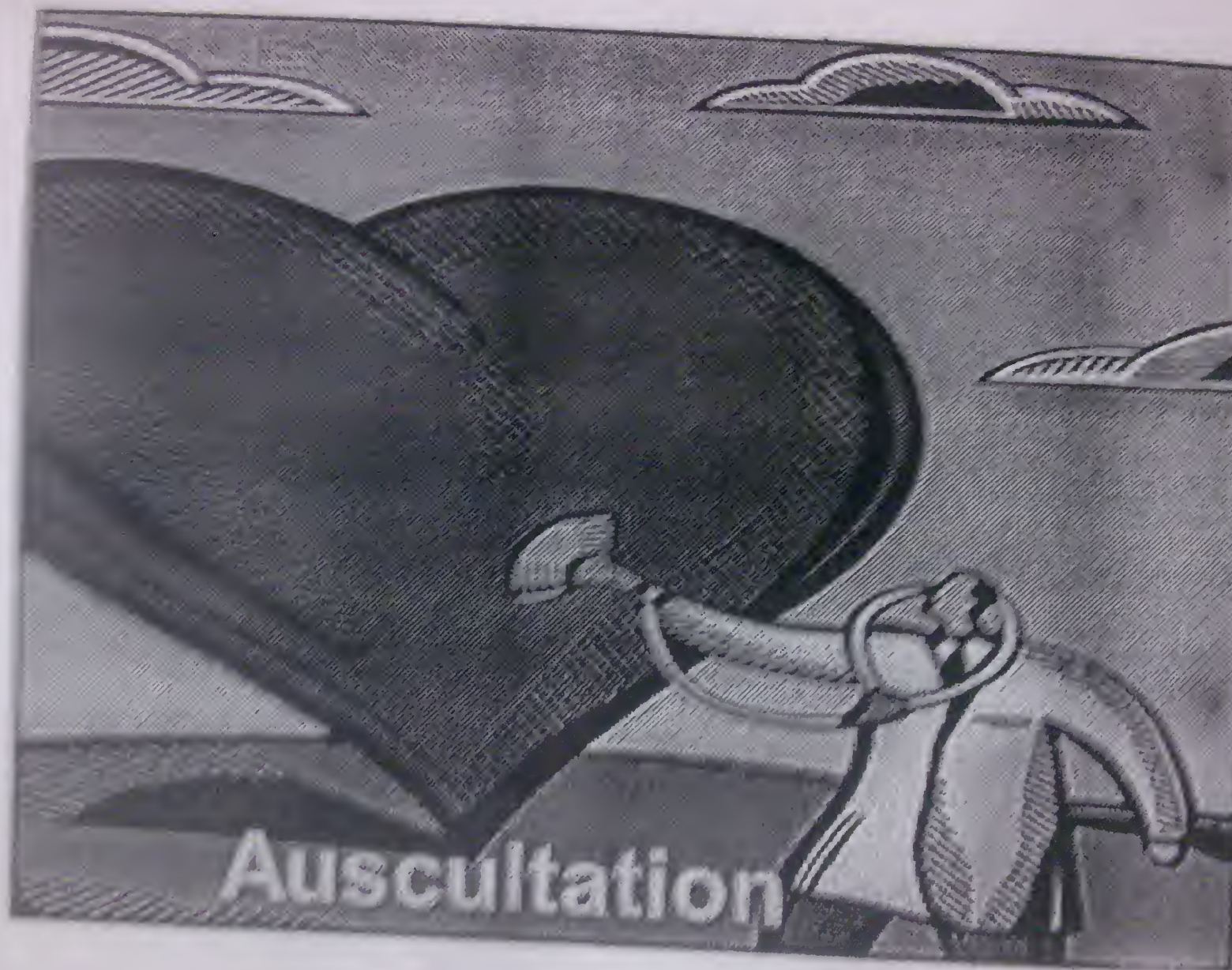
Percussion

Percussion

- Stay to the right side of the patient.
- With the left hand resting on the patient, do percussion with the tip of middle finger of left hand over the middle phalanx of the middle finger of the right hand over the following sites:
 1. Just outside the apex.
 2. Right sternal border
 3. Left second intercostals space.

Percussion

- It may detect dullness outside the apex beat in cases of pericardial effusion or dullness lateral to the right sternal border in cases of right atrium (RA) dilatation.
- Dullness in the second left parasternal area occurs in cases of pulmonary hypertension.

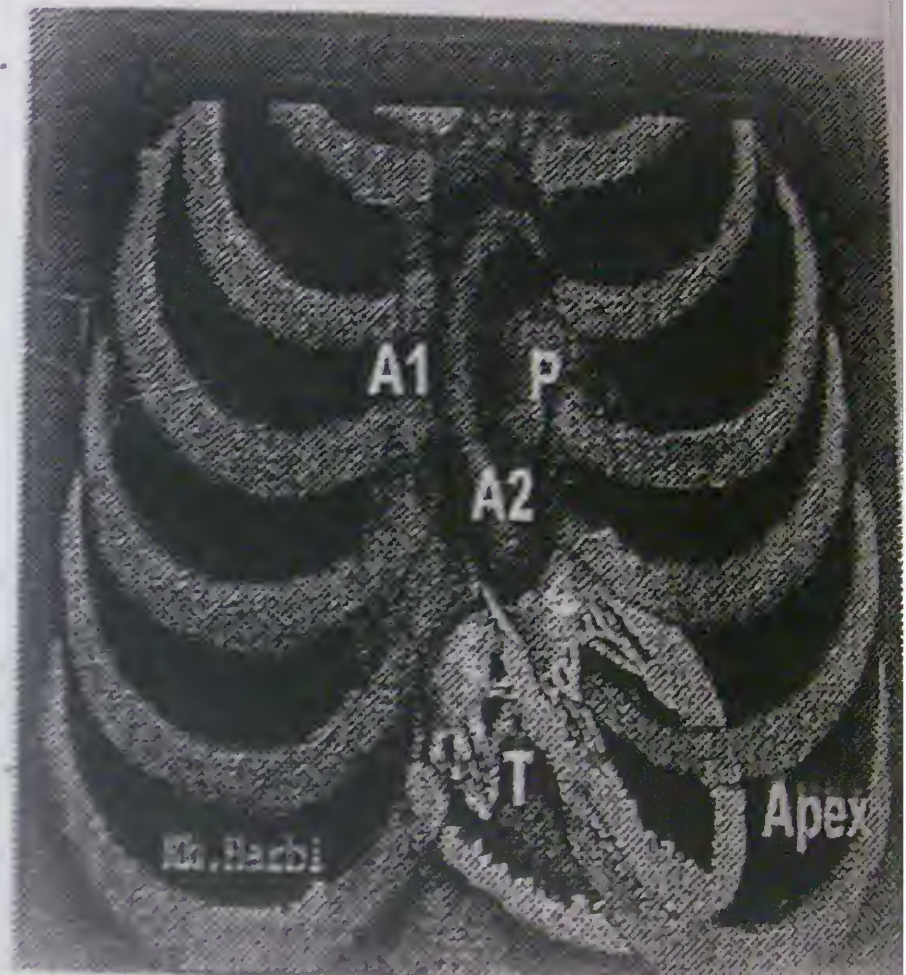


Auscultation

- 1. Make the child lay supine
- 2. Stay to the right side of the patient.
- 3. The diaphragm of the stethoscope is placed firmly on the chest for high-pitched sounds.
- 4. The bell of the stethoscope is more optimal for low pitched sounds

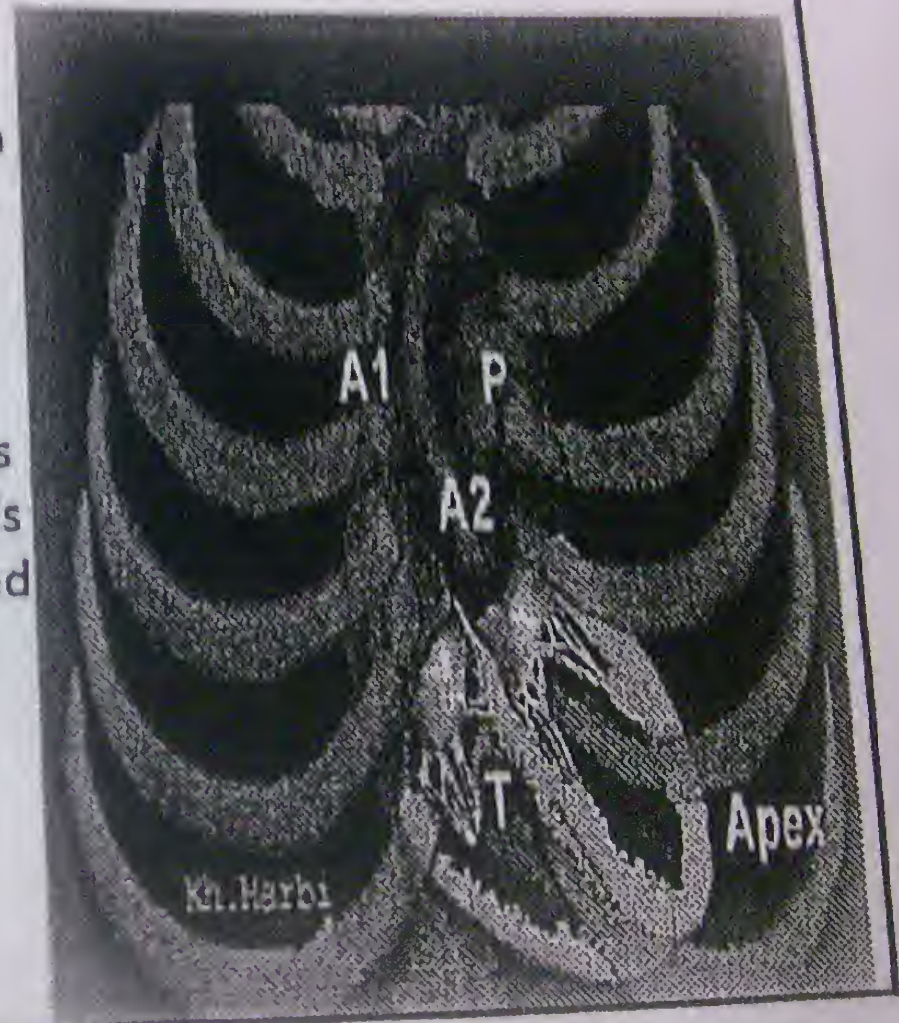
Auscultation

- 5. Auscultate the following areas:
 - a. Apex: is usually located in the 5th left intercostals space inside or just medial to the midclavicular line. It is the best site for auscultation of the first heart sound and mitral valve murmurs.
 - b. Tricuspid area: is located in the right lower sternal area. Tricuspid regurge is best heard in this area.



Auscultation

- c. Pulmonary area: Is located in the left second intercostals space. It is best site for auscultation of second heart sound and pulmonary stenosis.
- d. Aortic areas: 1st aortic area is located in the 2nd right intercostals space and 2nd aortic area is located in the 3rd left intercostals space. Aortic valve murmurs are best heard in these areas



Auscultation

**For maximum results from auscultation the followings
10 rules should be considered**

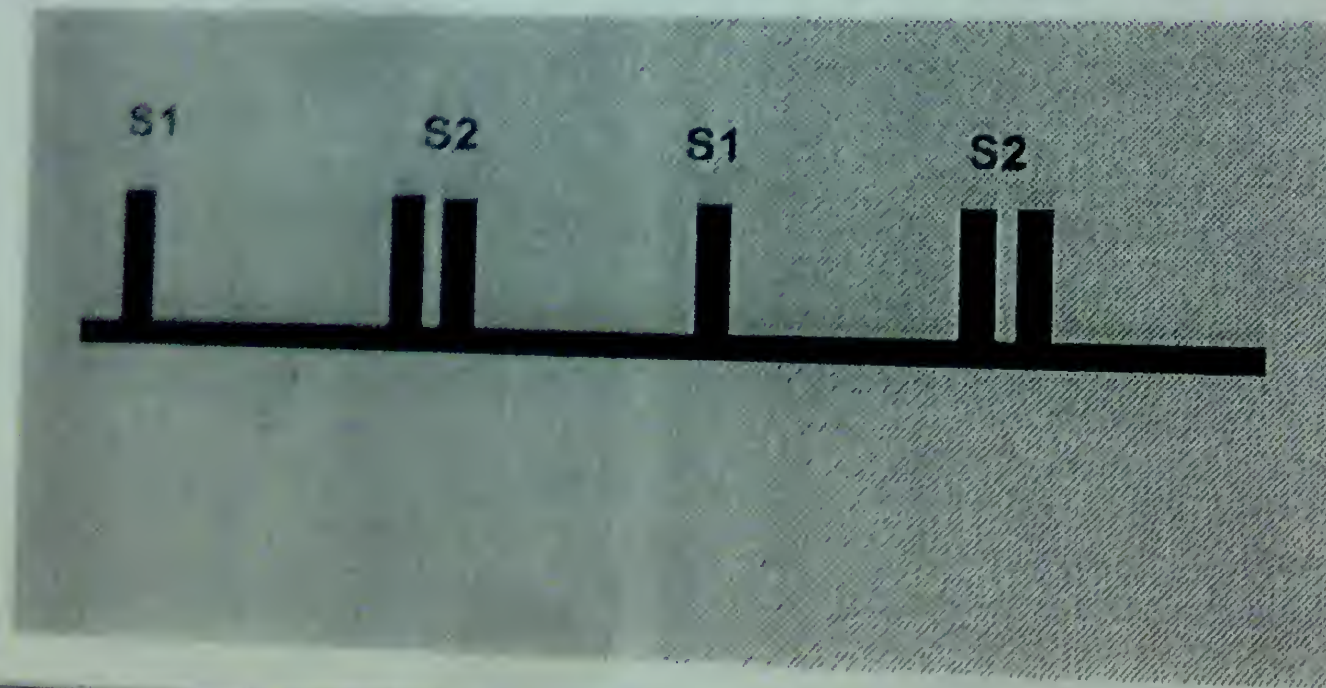
1. Be careful and patient.
2. Whenever possible perform auscultation when the infant is asleep.
3. Sometimes more information can be obtained from examining undisturbed infant with full clothes than from crying or vigorously active fully unclosed infant.
4. Repeated examination especially in neonates should be performed, since auscultatory finding may differ with heart rate changes or physiologic state.
5. Use your own stethoscope which is fitted for you.

Auscultation

6. Use both diaphragm and bell during examination.
7. Auscultate all the areas of the heart.
8. Each part of the cardiac cycle should be selectively auscultated.
9. Closing your eyes makes for better concentration.
10. You should sit comfortable to take your time in auscultation.

Auscultation

Heart Sounds and cardiac Cycle



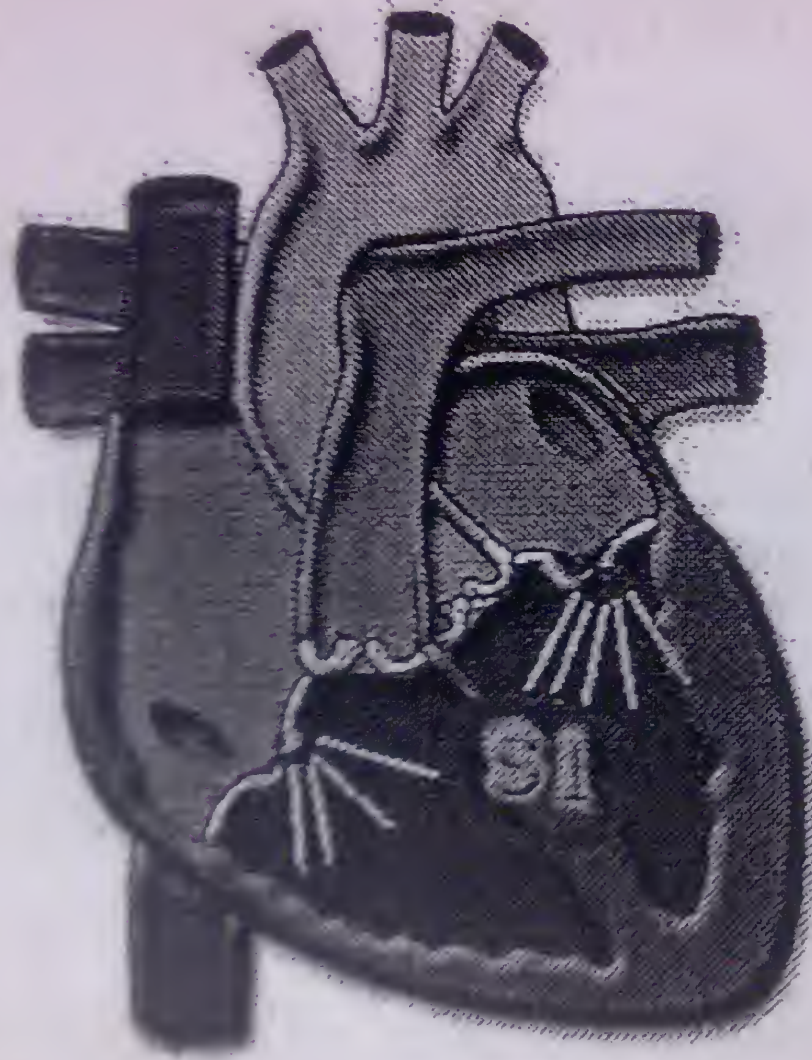
Auscultation

Heart Sounds

First heart sound (S₁)

- It is related to closure of mitral and tricuspid valve.
- It is best heard at the apex where it is louder than the second heart sound (S₂) in this site
- It is usually single in childhood except in case of Ebstein anomaly





Formation of 1st heart sound

Auscultation

- The first heart sound is accentuated in:

- a. Mitral stenosis
- b. Tricuspid stenosis
- c. Hyperkinetic circulation as patent ductus arteriosus (PDA).



Auscultation

- The first heart sound is muffled in:
 - a. Myocarditis
 - b. Cardiomyopathy

Auscultation

Heart Sounds

second heart sound

- It is related to closure of aortic and pulmonary valves
- It is best heard at the 2nd and 3rd left intercostals space where it is louder than the S₁ in this site





Formation of 2nd heart sound

Auscultation

Heart Sounds

second heart sound

- It is usually split and consists of aortic and pulmonary components.
- The aortic valve closed before the pulmonary valve by about 20 ms.
- Splitting varies with respiration: It increases during inspiration and decreased during expiration

Auscultation

Abnormal second heart sound includes:

1. Single second heart sound:

- It may be formed only of pulmonary component in cases of severe aortic stenosis or aortic atresia.
- It may be formed only of aortic component as in severe pulmonary stenosis, pulmonary atresia or tetralogy of Fallot.
- In cases of truncus arteriosus, only one valve is present.

Auscultation

Abnormal second heart sound includes:

2. Loud second heart sound:

- The pulmonary component is loud in pulmonary hypertension.
- The aortic component is loud in systemic hypertension and transposition of great vessels



Auscultation

Abnormal second heart sound includes:

3. Abnormal splitting of second heart sound:

- It is widely splitted (exceeding 50 to 60ms) in cases of atrial septal defect (ASD), pulmonary stenosis, tetralogy of Fallot and total anomalous venous return.



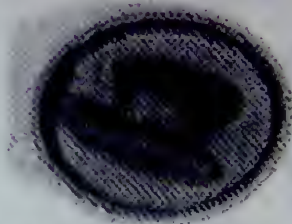
- In ASD, the term fixed splitting is used where the splitting does not vary with respiration.
- Narrow splitting occurs in pulmonary hypertension

Auscultation

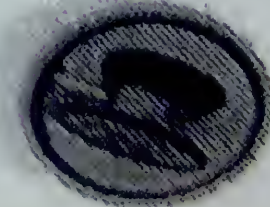
Heart Sounds

Third heart sound

- It is usually normal in children but may represent a pathologic condition if associated with other abnormal findings.



- Fourth heart sound
- It is always abnormal in children



Auscultation

Clicks

- *Ejection Clicks* occurs shortly after S_1 ; they originate from the opening of stenotic but mobile aortic or pulmonary valves.
- *Mid or late systolic clicks* indicate prolapse of the mitral or tricuspid valve.

Auscultation

Murmurs

- Heart murmurs result from turbulence of normal blood flow through a narrow structure or increased blood flow through a normal structure.

Auscultation

Murmurs

- Murmurs should be described regarding the following;
- Site; may be apex, tricuspid area, pulmonary area, aortic area...etc.
- Radiation; like to axilla, to suprasternal area, all over the heart...etc.
- Timing; systolic (Ejection systolic, pansystolic or late systolic), diastolic (Early diastolic, mid diastolic or late diastolic) or continuous (occurs in systole and diastole).
- Pitch; High or low pitch.
- Relation to change in position; early diastolic murmur of aortic regurgitation is best heard when patient is leaning forwards.

Auscultation

- **Loudness;** it is described in the form of grades
- **Grade 1.** Soft and heard after a period of extended listening.
- **Grade 2.** Soft and heard immediately.
- **Grade 3.** Loud, unassociated with a thrill.
- **Grade 4.** Loud, usually associated with a thrill.
- **Grade 5.** Loud, audible with stethoscope barely off thorax.
- **Grade 6.** Loud, audible with stethoscope off thorax.

Auscultation

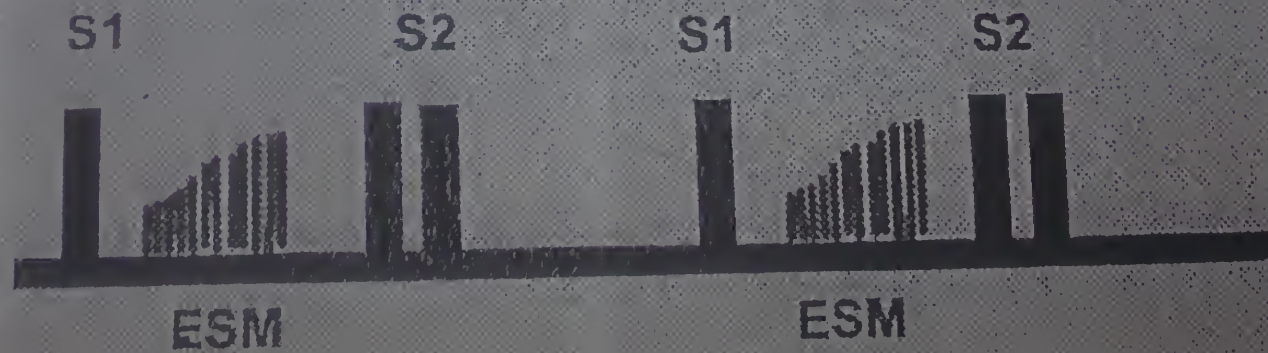
The following are examples of some pathological murmurs

- Systolic murmurs
 - Ejection systolic
 - pansystolic
- Diastolic murmurs
 - Early diastolic
 - Mid diastolic
- Continuous murmurs

Auscultation

- Ejection Systolic murmurs

It starts after S_1 by short time then increases in intensity and ends before S_2 .

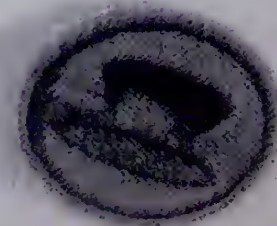


Auscultation

- *Ejection Systolic murmurs*

Examples are:

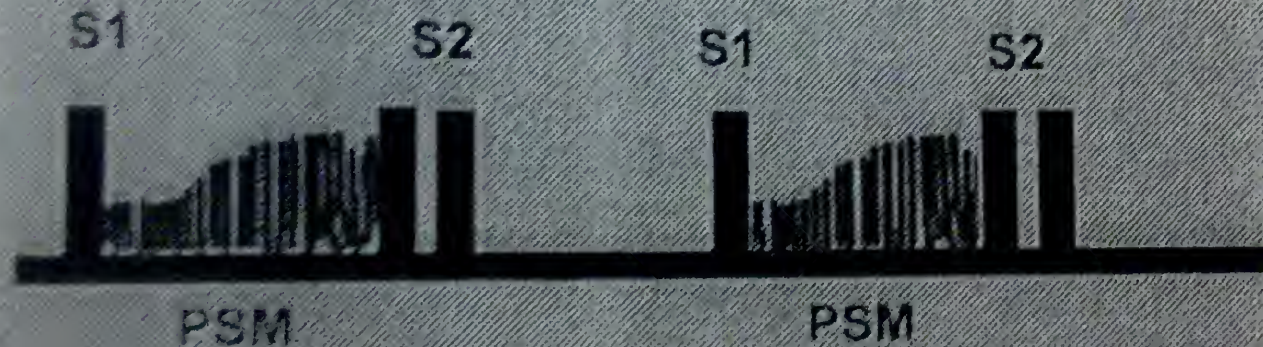
- i. Pulmonary stenosis at pulmonary area
- ii. Aortic stenosis at aortic area
- iii. ASD at pulmonary area
- iv. PDA in neonates



Auscultation

- Pan Systolic murmurs

It starts with S1 and often obliterates it and continue throughout systole



Auscultation

- Pan Systolic murmurs

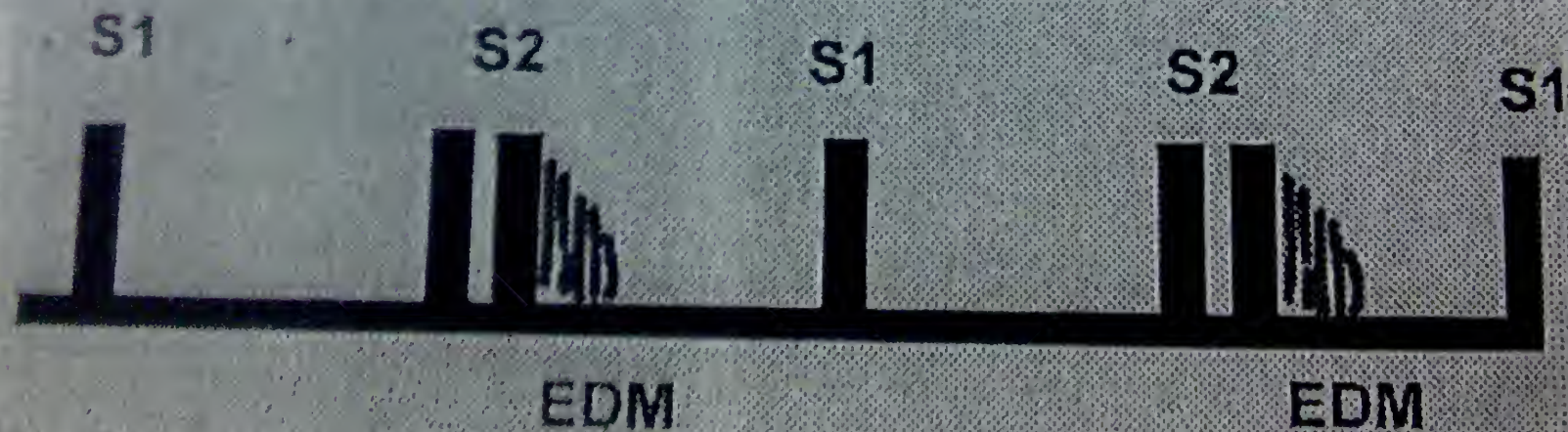
It occurs with

1. VSD
2. Mitral regurge
3. Tricuspid regurge



Auscultation

- Early diastolic murmurs
- It starts after S2 immediately. It is high pitched and decrescendo.



Auscultation

- Early diastolic murmurs
- It starts after S2 immediately. It is high pitched and decrescendo. Causes are;

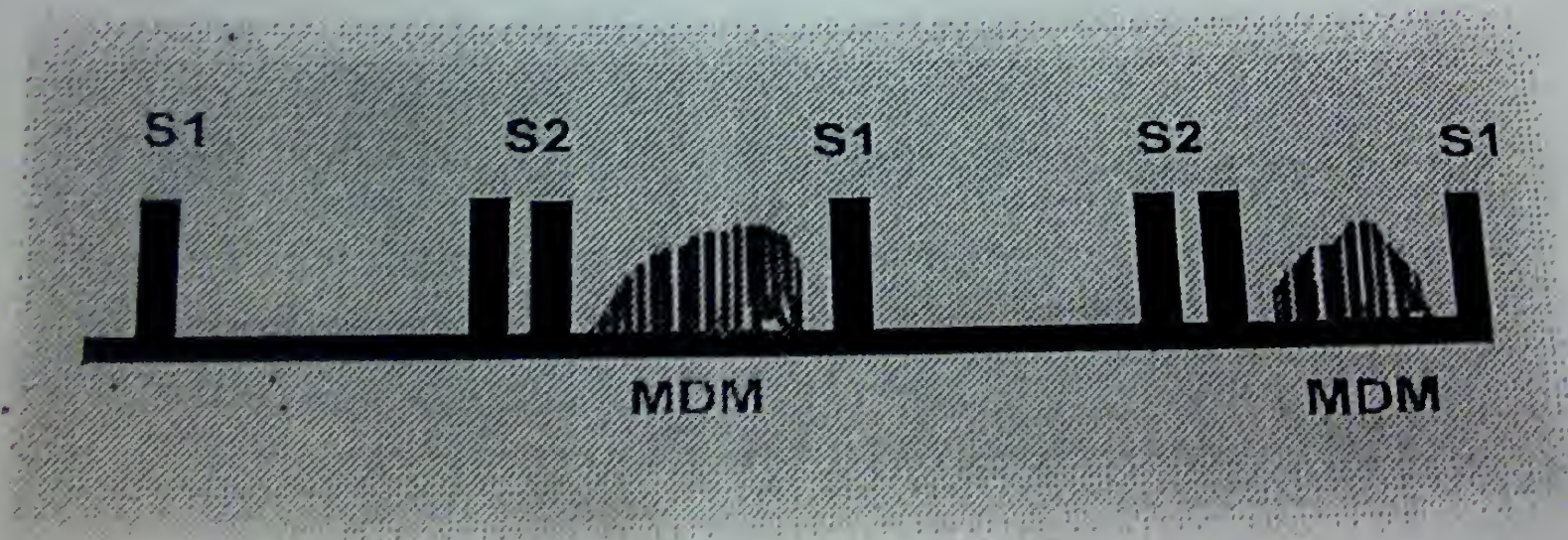
1. Aortic regurge.
2. Pulmonary regurge.



Auscultation

- Mid diastolic murmurs

It occupies the mid portion of diastole and represents increased flow across atrio-ventricular valves.



Auscultation

- Mid diastolic murmurs

Causes are;

1. Mitral stenosis
2. Tricuspid stenosis
3. Left to right shunts (ASD, VSD, PDA) due to relative increase of blood flow across normal valves



Auscultation

- Continuous murmurs

Murmur begins in systole and continues in diastole.

